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Waterwheels and Engines, &c.—G. W. von Nawrocki (com.)., 673. H. Conradi (com.), 675.

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Wheels for Machinery.—W. T. Hamilton, 654. H. J. Haddan (com.), 681.

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⁂ *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

SONG TO DAPHNE.

So fond is thy heart, so fair is thy face—
Fairest and fondest of beauties to me!
So gentle thy birth, so noble thy race—
Noblest and gentlest, the world welcomes thee!
While the harp is still strung,
Shall thy name be unsung?
Oh no! it will wake in melody free.

So sweet thy blue eyes, so lovely and rare—
Loveliest and sweetest of jewels to me!
Rich the fair folds of thy choice flowing hair!
Choicest and richest, all grace is in thee!
While warbles the bird,
Shall her song be heard
In vain in the heavens, o'er mountain and lea?

Bright is thy smile, fresh as roses at morn—
Freshest and brightest thy charms are to me!
Happy thy life, pure as dews of the dawn—
Purest and happiest thy spirit shall be!
While carries the dove
Her message of love
Shall she carry in vain a message to thee?

HENRY GEORGE HELLON.

THE BISCUIT COMPASS.

THE manner in which erroneous statements sometimes find circulation in the newspapers is illustrated as follows:—

A half column appears in print descriptive of a new process for preparing, baking, and putting up in sealed packages for market an improved food in very compact form, specially intended for long voyages, military purposes, hunting expeditions, &c. This paragraph is "boiled down" by the next editor, who is short of space, as follows:—

"A London firm has introduced a hunting biscuit, containing in a small compass a great amount of nutrition."

Editor number three wants something still a trifle shorter, and so reboils the above item, making it to read:—

"A London firm has introduced a hunting biscuit containing a small compass."

The original statement is thus transformed into a curious falsehood; and many people, with both items before their eyes, would fail to notice any fallacy in the last, because every word given is contained in the preceding item.

A TELEPHONE RECIPE.

PROFESSOR Barrett, in a recent lecture on the telephone, gave a recipe for making a cheap one. Take a wooden tooth-powder box and make a hole about the size of a half crown in the lid and the bottom. Take a disc of tinned iron, such as can be had from a preserved meat tin, and place it on the outside of the bottom of the box, and fix the cover on the other side of it. Then take a small bar magnet, place on one end a small cotton or silk reel, and round the reel wind some iron wire, leaving the ends loose. Fix one end of the magnet near, as near as possible without touching, to the disc, and then one part of the telephone is complete. A similar arrangement is needed for the other end. The two are connected by the wire, and with this Professor Barrett says that he has been able to converse at a distance of about 100 yards.

Reviews.

ABNEY'S PHOTOGRAPHY.

"A Treatise on Photography." By W. De Wiveleslie Abney, F.R.S., Captain R.E., and late Instructor on Chemistry and Photography at the School of Military Engineering, Chatham. London: Longmans, Green, and Co. 1878.

WE have heretofore called attention to the excellent series of text-books of science published by the above-named firm, of which the work under notice forms a part; and we have now to add in confirmation of the value of this series that the "Treatise on Photography" now before us is fully up to the standard of excellence of the volumes issued on other subjects belonging to Messrs. Longmans' series.

It will be seen that by the position lately held by the author, that he speaks with authority on the subject of photography. The aim of his book is, as stated in the preface, chiefly to give a rational explanation of some of the different phenomena met with in photography, and therewith to supply sufficient practical instruction to enable the student to produce a landscape picture which shall be technically good and, at the same time, to be of use to him if he make photography an aid to research.

To students and others interested in the science and practice of photography, we can cordially recommend this work.

THE INVENTOR OF THE WOOLWICH SYSTEM OF ORDNANCE.

"The 'Woolwich' System of Rifled Ordnance." A Contribution to the History of its Invention. By its Inventor. London: Printed and published for the Author by C. F. Hodgson and Son, Gough-square, Fleet-street.

THIS pamphlet gives an account of the course pursued by our Government departments in regard to new inventions submitted to their notice. In a case of this sort the victim's own statement is the best information on the subject. We therefore present our readers with the *resumé* of the case as stated in the pamphlet.

"Startled Europe [in 1865] had been looking to her weapons. Abroad, the system of ordnance illustrated on the fields of Magenta and Solferino had been 'adopted without modification by the armies of Spain and Italy; more or less closely imitated by Austria, by Russia, by Holland, and we believe by Sweden and Denmark.' In England the Armstrong gun had been adopted, at a heavy expense to the nation. The only permanent feature in this system has been the adoption of studded projectiles—that is to say, of the system for which I had applied for protection in 1854—the system which the War Office has acknowledged I was the first to bring under its notice in a concrete and tangible form.

"The Armstrong gun may or may not have seen its day; this is certain, that rifled cannon fitted for firing studded projectiles have not yet seen theirs. Our adoption of this system was tardy—England has all through her history lagged in artillery—but it was an adoption; and in 1865 I wrote to remind the War Office of its final adoption, without permission, of ideas which in 1856 it declined to see proven. The War Office, in replying, made the very remarkable acknowledgment that I was the first formally to bring the system under its notice, and offered me £100 to say no more about it. This is the last point to which I invite the reader's especial attention. Let us recapitulate these points.

"1. The Ordnance Committee states, in 1855, that my system has not been tried.

"2. From 1855—1872 my drawings and model remain in the hands of the Office.

"3. In 1865 the Office acknowledges me the first to bring the system of studded shot under the notice of the Department, and, still retaining my drawings and model, offers me £100 by way of compensation.

"It is now obvious—

"1. That the present system of studded projectiles was not known to the War Office before December, 1854.

"2. That the French campaign in Italy in 1859 was the first in modern days in which rifled artillery was used in actual warfare.

"3. That my system was communicated to the French in 1858, fourteen months before the outbreak of the Austro-Italian war.

"4. That a certain system of rifled ordnance has since that period been adopted by the English Government.

"5. That the system then adopted by the English Government is in principle identical with that which I offered to it in 1854.

"6. That this adoption of my invention has been virtually acknowledged by the War Office.

"Between the 'Woolwich system' and mine, as first submitted, there is the slight difference of a chambering of both sides of the groove, instead of one only. The shape of the groove adopted by me was identical with that used in the cannon sent to Italy."

"The crowning cruelty of the War Office was its insinuation of my want of priority. I will not open up here the page of the history of French invention. It is enough, in the first place, that my invention was complete, fit and ready for proof, in 1854, and that I state it to have been perfectly original. In 1854-5 the War Office stigmatized my system as untried; the French had no system of ordnance firing studded projectiles till 1859; and whatever the French experiments may have been, we have the testimony of, amongst others, the Edinburgh Reviewer, as quoted, that they were carried out with the utmost secresy. Finally, the value of the invention to the English Government depended solely and wholly on its effectiveness and on early possession. I came to the help of my country in its need. The War Office refused my help then, when it might have behaved with a patriotism equal to my own. To refuse me compensation now is virtually to fine me for its own want of perception. The stress of facts has compelled it to invalidate its own plea of prior information—the only feeble one it has to oppose to my cry for justice. It has already acknowledged the validity of my claim; let it amplify its acknowledgment, and dare to be nobly just, and refuse not to follow 'Quo fas et gloria ducunt.'—W. F. PADWICK."

DR. LLOYD ON PHYSICAL SCIENCE.

"Miscellaneous Papers Connected with Physical Science." By Humphrey Lloyd, D.D., D.C.L., Provost of Trinity College, Dublin, formerly Professor of Natural Philosophy in the University. London: Longmans, Green, and Co., 1877.

THESE miscellaneous papers, as termed by the author, are reprinted from the *Transactions* of the Royal Irish Academy, the "Reports of the British Association," &c., and extend from 1834 to the present time.

Bearing as they do mostly on matters of physical science we advise those interested to peruse them, as they will be, we think, to their benefit and advantage.

There is one of the papers, or rather a lecture that we notice specially, which, although written in 1841, will be found to contain suggestions relative to the mode of teaching applied sciences, which, to teachers, would still be found of the utmost value. It is true that since this lecture was given science has made great strides and is now looked upon as a necessity, and not, as years ago, purely a matter of *convenience* in education.

WHITWORTH MEASURING MACHINE.

"The Whitworth Measuring Machine." By T. M. Goodeve, M.A., and C. P. B. Shelley.
London: Longmans, Green, and Co., 1877.

As the title of this book implies it is descriptive of the machines made by Sir Joseph Whitworth, and includes, besides the measuring machine, descriptions of the surface plates, gauges, and other measuring instruments identified with the name of Whitworth.

As the descriptions of these machines have from time to time been given in various works, it is only necessary for us to draw attention of those interested, and to state that they will find contained in this small volume plates and diagrams of the various machines, with full descriptions of the action of working the same. To engineers especially the work will be found of value.

REVIEWS POSTPONED.

We are compelled to postpone Reviews of several works which are worthy of notice. Amongst these is one by R. A. Proctor, Esq.

"Economic and Financial Science," by W. M. Halbert, may also be named as a work entitled to our serious consideration.

Messrs. Cassell's serial publications, such as the "Domestic Dictionary," "Science for All," and the "Practical Dictionary of Mechanics," deserve an amount of attention which we cannot give to them now.

"Hammand," a Poem, is also postponed; and with regard to "Night and Day," the record of the good work being carried on by Dr. Barnardo, we can only say it is more than usually interesting to all well-wishers of humanitarian progress.

INDUSTRY AND ART IN LONDON.

(By a Correspondent.)

Blowing Apparatus.—The new street in the City (Queen Victoria-street) has been mostly taken up by mechanical engineers, founders, and metal merchants. The premises are very fine. Some, presenting only a narrow office or shop front, go back a long way, and contain large bank-like offices. One of these is held by the proprietors of the Cyclops power fans, blowers, and forges, who have premises in three other streets. A comparatively recent invention of theirs is the power fan, with patent friction driving gear, which we described as first exhibited at the Royal Agricultural Show at Liverpool last July. It was invented by the proprietors, Messrs. Rownson, Drew, and Co., because in early days of the sand blast process of engraving on glass, the sand was drawn into the fan case, where it caused bearings to heat and other inconveniences. With the arrangement of patent frictional gearing, almost any velocity required can be obtained with great economy of power. The machine is complete in itself, requiring no counter-shaft, and takes up little room. The principle briefly is, that instead of multiplying the speed through the usual means connected by belts, the requisite speed is obtained by a small roller held between two large pullies by a leather belt passed round the two latter. Two pairs of these pulleys are used, actuating two rollers on opposite ends of the fan spindles. The centrifugal action of the belt when running at high speed secures ample adhesion between the surfaces of the pulleys and the rollers, and as the rollers and the fan-spindle are carried in equilibrium between the pairs of pulleys, there is a minimum of friction in the bearings of the spindle. The machine at Liverpool, with 15 inch span, yielded 800 cubic feet of air a minute.

Wall-paper Manufacture.—This is a branch of industry which it happens we have scarcely ever entered upon, and we avail of an opportunity with pleasure of giving a few particulars from the information of Messrs. Wilcoxon and Co., 17, Newington Causeway, S.E., who have also one of the new shops in Queen Victoria-street (No. 89). This firm is a very large one. The early English and Dado, and those kinds of papers which are bordering, filling, and the said Dado, are the most largely supplied, and are the most popular papers manufactured. For the information of readers who are not conversant with this subject, it is for us to state that the Dado is a kind of wainscot or screen, which makes a few feet at the bottom. We have inspected some of their designs of Dado and fillings, one of which is of gold and drab on a black ground. The pattern is a kind of early English, in squares and diamonds, the squares containing a flower with leaves, and the diamonds have small leaves outside and a conventional figure in. The effect is novel and rich. Another good artistic design is an Indian leaf in gold and drab on same ground. For libraries and dining-rooms some of their dark papers would be very suitable.

Musical Publications.—We are glad to seize an opportunity of noticing a very deserving work, viz., a pretty gilt-bound volume, which, though only published at 4s. 6d., contains a splendid selection of the Standard Songs of England, Ireland, and Scotland. The songs are superior ones, including some heard in youth, which we never expected to hear again, such as "The Captive Knight," "Banks of Allan Water," and others, like "O, Twine the Wreath," music by the late Sir H. Bishop, and "The Pilot." This work has just been published by Messrs. Swan and Pentland, Great Marlborough-street. As to their superior printing, they mention to us that both music and book printing are executed in Edinburgh.

Drama.—We have not much space left for remarks on Dramatic Art and Literature this month, but we may just mention that at the Grecian Theatre, City-road, a very good pantomime, entitled *Roley Poley*, is being performed, and the parts are so well acted by the performers that the entertainment must be pronounced a most satisfactory one. As columbine, Miss Conquest, daughter of the lessee, is everything that could be desired.—At the Theatre Royal Haymarket, Shakspeare's *Twelfth Night* has been the principal piece, and, although the actors and actresses are worthy of commendation, yet Mr. D. Fisher, jun., as the Clown, strikes one as eminently good.—At Hengler's Circus a new spectacle has been presented, following the Pantomime, which, with good equestrian feats, &c., will reign for some time.

FOREIGN SCIENCE.

The Chamber of Deputies, at Paris, has unanimously decreed that the funeral expenses of M. Claude Bernard should be defrayed by the State. A credit of 500 francs has been opened for the purpose at the Ministry of Public Instruction, Fine Arts, &c. So it is proposed to honour the illustrious founder of experimental physiology. He died on Sunday, the 10th ult.

Les Mondes sets forth that it would be of great importance to be able to hear sounds transmitted by the telephone, without being obliged to hold the instrument constantly to the ear. Professor Balneto says he has found a solution. He says: "I made the current of a Daniell pass into the thread of the *bobine* of the telephone, or rather into the thread of another one, placed by side of the first, of which it is independent. By means of an electro-magnetic interrupter (automatic), I interrupt and close a great number of times the circuit of the pile, so that a part of the telephone renders a sound identical with that of the interrupter—a sound which is repeated in the telephone placed at a distance, and in a manner intense enough to be heard without applying the instrument to the ear. I believe even that, to obtain this result, the current of a little magneto electric machine would be sufficient.

As to the rules for entries for the Exhibition of 1878, the system of turnstiles hitherto employed will be abandoned. The price of the daily entries will be managed by means of tickets, printed at the Bank of France. These tickets will be had at tobacconists, bureaux de postes, and telegraph offices. Railway companies, conveyance and boat offices, and newspaper sellers will be authorized to sell them. Besides the tickets, subscription cards for 100 francs each person, available during all the exhibition, will be placed at disposal of the public. These cards will give right of admission, not only in the general hours, but also in the hours reserved for study, to the Palace of Champs de Mars, and all annexes of the Exhibition, and particularly to the special exhibition of animals. Every person who wants a *carte d'abonnement*, should present his portrait carte, photographed in double copy, to the authorised Agent of treasury, near the Universal Exhibition. This functionary will keep one of the copies, and deliver to the party a receipt, which, being fixed upon the back and half the *recto* of the photographed copy, will constitute the *carte d'abonnement*. The delivery of gratuitous entrance cards to Exhibition, and others having a right, will be submitted to the same formality of photographed copy.

The following prediction was made by a French savant as to the action of the planet Venus during last month. From 11th to 21st it would be a morning and evening star. So Venus, on 18th, would rise at thirty-one minutes before the sun and retire forty-three minutes after, and 19th and 20th a few minutes later. Therefore, on 19th the phenomenon would be most observable. That day Venus would rise at 6 a.m. and the sun at 7 a.m., the sun would set at 5.26 p.m. and Venus at 6 p.m.

The French scientific papers still teem with notices of Leverrier. At the opening of the conference of the Scientific Association the President said:—"The works to which he has attached his name represent those of an entire academy; his discoveries denote genius; the tables which he has calculated by Herculean labours direct all the observatories of the world and the ships of all nations.

There are now a great number of literary and scientific associations in each province of Brazil, and the government supports liberally a gigantic scheme of education, primary, secondary, and university, all over the Empire. In regard to present state of emigration the authorities do not obtrude themselves upon the English, because they are receiving colonisation extensively from the Continent. They complain that the class of emigrants they have received from England before had no adaptability. There would be a better scope for more thinking-men, such as the higher class of artisans, who make improvements, some of whom we rank among our readers. A very large number of the better class of Brazilians speak English perfectly, and we are credibly informed that even on the system of English learnt in Brazil there is a competent knowledge amongst a great many people.

Col. W. G. Reynolds has concluded a contract with the English Government by which the Post Office Department has adopted the Bell telephone as a part of its telegraphic system. In a recent telephonic experiment in connection with the cable, 21¾ miles long, between Dover and Calais, there was not the slightest failure during a period of two hours.

EVAPORATIVE POWER OF LOCOMOTIVE BOILERS.

By J. A. Longridge, M. Inst. C.E.

Certain widely diverging opinions exist among practical men with reference to the evaporative efficiency of the various elements of a locomotive boiler; such as the area of the fire-grate as compared with the total heating surface, the ratio between the tube surface and the fire-box surface, and the rate of combustion per square foot of fire-grate. The cause of such divergence of opinion may be said to be due to the multitude of variable conditions; and it is only by embodying these in a symbolic formula that the relative effects can be estimated.

Mr. D. K. Clark's formula, $w = a\ r^2 + b\ c$, from its empirical nature, is only applicable within certain limits; but we may adopt a new formula, based upon well-known physical laws and mathematical principles. Assuming any given consumption of fuel per hour, the amount of heat generated is to be first determined; then, from the laws of the transmission of heat through plates, the quantity which passes through the fire-box surface into the water is to be deduced, and from what remains the temperature of the gases entering the tubes may be found. From this the loss of temperature in passing through the tubes can be calculated, based upon the same law of transmission, and thus we obtain the temperature of the gases in the smoke-box. From the loss of temperature in passing through the tubes, the evaporative effect of the tube surface is ascertained, and this, added to that of the fire-box, gives the total evaporative effect of the boiler.

From this formula the evaporative powers of twenty engines let us calculate, and the results compared with actual experiment and with those given by Mr. D. K. Clark's formula. It will be seen that the tube surface is a very important element, and that on an average the tubes effect nearly 80 per cent. of the whole evaporation. Also that the generally-received idea, that 1 foot of fire-box surface equals 3 feet of tube surface, is fallacious; indeed, the proportion is very variable, for while, in the "Ixion," 1 foot of box-surface only equals 1·7 foot of tube surface, yet in No. 33, Caledonian engine, 1 foot of box surface equals 5 feet of tube surface. Consequently no fixed ratio affords a safe rule for practice. It can be demonstrated that the length of the tube has nothing to do with economy of evaporation, but that this depends simply upon the ratio between the consumption of fuel per hour and the total absorbing surface. As regards the diameter of the tubes, it may be shown, adversely to the late Mr. Zerah Colburn, that the diameter is a matter of no consequence so long as the proper amount of surface be obtained. The same remark may be made as regards the ratios between the fire grate and the heating surface. It is not the area of the fire grate, but the weight of fuel consumed per hour, which has to be considered; and as regards economy of evaporation, it matters little whether 50 lbs. of coke per square foot per hour be burned in a grate of 20 square feet area, or 100 lbs. per square foot per hour in a grate of 10 square feet area. In each case, if the absorbing surface be the same, the economy of evaporation will be the same.

The question, how far the combustion of fuel is perfect, may here be examined; and one may point out that in many cases it is very far from being so, some French experiments exhibiting losses of from 22 to 39 per cent.

The general conclusions arrived at may be thus summed up: that no fixed rule can be established as the best for the relative proportions of the fire grate, fire box, and tube surfaces; that length of the tube has nothing to do with economic effect; that the diameter of the tube is also a matter of indifference; that economy of fuel does not depend upon the rate of firing; that when the quantity of fuel burnt is moderate, say 50 lbs. or 60 lbs. per square foot of grate per hour, the combustion is nearly perfect, while with hard firing considerable loss occurs from carbonic oxide passing away unconsumed; and that a large increase of heating surface in proportion to coal burnt only slightly increases the economic effect, which within the limits of practice in locomotive engines is nearly in proportion to the fourth root of the heating surface.

As an addendum the action of the blast-pipe may be discussed; and it is open to contention that, though a powerful agent in effecting rapid combustion, it is, *per se*, a very extravagant one; yet in general in the case of locomotive engines this extravagance is not chargeable to it, since there is a large quantity of steam available which would otherwise be wasted. A formula can be given for calculating the power of a jet of steam, as an agent for creating a draught, based upon experiments made in 1851 and 1852. When applied to the blast-pipe of the locomotive this shows that, on average, the power required to force the air and gases through the fire grate and tubes is only about 8½ per cent. of the potential power of the steam escaping through the blast-pipe. In conclusion, it is to be observed that a large increase of effect will be obtained by subdividing the exhaust steam into a number of small jets instead of relying upon one large one, and that under certain circumstances this increase of power will be of great utility.—(Abridgment of a Paper recently read before the Institution of Civil Engineers.)

THE LIQUEFACTION OF AIR AND ALL THE PERMANENT GASES.

Matter exists in the three forms, solid, liquid, and gaseous, and is in all these states supposed to consist of molecules which are never at rest, but which always possess a movement or vibration of their own. In the solid state the molecules vibrate about fixed positions from which they are prevented by the force of cohesion from departing, and which movement does not interfere with the shape of the body. In liquids the fixed positions are absent, and the molecules, while still affected by the force of cohesion, are free to move and rotate about themselves. In gases the molecules are altogether freed from their mutual attraction, and follow the ordinary laws of motion. When they meet they repel each other, and thus a gas will expand indefinitely unless enclosed in an envelope.

Under certain conditions of heat all substances in nature are capable of assuming these states. When heat is imparted to a solid the motion of the molecules is accelerated until the limit of such motion is reached, which allows the body to remain in solid form. Further elevation of temperature determines the passage of the substance to the liquid form, and ultimately to the gaseous state. Still further application of heat after this last condition has been assumed increases the velocity of molecular motion, and causes the molecules, if in a closed vessel, to resist greater pressure, or under the same pressure to resist that pressure over a greater area; hence follows the phenomenon of the expansion of gases. Now, if the temperature be indefinitely raised or the volume of space indefinitely increased under a constant temperature, the vapour or gas will finally approach a state corresponding to that of a perfect gas, that is, one which possesses the condition of perfect fluid elasticity and presenting under a constant pressure a uniform rate of expansion for equal increments of heat. The conditions, however, of an absolutely perfect gas cannot be attained, because all gases change their physical state when the molecular movement of their particles is modified. And this modification may be effected in two ways. First, we may reverse the operation above detailed, and abstract heat, producing just the reverse result to that noted; or, second, we may overcome the motion of the molecules by actual compression. That by these means presumably permanent gases could be liquefied was demonstrated by Faraday in 1823, but he is said to have been anticipated by Monge and Cluet in the condensation of sulphurous acid in 1800, and by Northmore, who liquefied chlorine in 1805. The simple apparatus used by Faraday consisted of a bent glass tube, having a long and short leg at right angles. In the open end of the longer portion was placed a substance from which gas could be obtained by heat, after which the tube was hermetically sealed. The shorter leg was then plunged into a freezing mixture, and by the application of heat to the long leg large quantities of gas were produced, which, through being confined in a very small compass, was subjected to its own pressure and to the reduction of temperature by the freezing mixture until finally the liquid form was assumed. Faraday in this manner liquefied chlorine and several other gases supposed to be permanent, and demonstrated the truth that between vapour and gas, the one being transformable into liquid, the other not, no difference exists, or, more broadly, that the three states of matter, liquid, solid, and gaseous, are not specific to any form of matter, but solely depend upon the mode of motion of the molecules of the substance.

A few weeks ago, to have stated this law thus broadly would have been to neglect an apparently very important exception, viz., that six gases had persistently refused to be governed by it; and although, theoretically, it was impossible to except them, still, practically, the ingenuity of chemists and physicists had failed in all attempts to reduce them to actual conformity to the law. Six gases — hydrogen, oxygen, nitrogen, nitric oxide, marsh gas, and carbonic oxide—had resisted all efforts to liquefy them. Records of tests of this kind are not wanting; and among the most elaborate experiments are those made by Dr. Andrews, and described by him before the British Association in 1861. He used the elastic force of the gases evolved in the electrolysis of water as the compressing agent, and subsequently mechanical means. The gases were compressed in capillary tubes and then subjected to the cold produced by the carbonic acid and ether bath. Atmospheric air was compressed by pressure alone to 1-371 of its original volume, and by the united action of pressure and a temperature of—106 degs. F. to 1-675, in which state its density was little inferior to that of water. Oxygen was reduced to 1-324 of its volume by pressure, and by pressure and cold to 1-554; hydrogen by cold and pressure to 1-278; carbonic oxide by same to 1-278; and nitric oxide to 1-680. Yet it is stated that none of these gases exhibited any appearance of liquefaction. Berthelot also made experiments in the same direction in 1850, and by means of the expansion of mercury, subjected oxygen, nitric oxide, and carbonic oxide to immense pressures. He concludes "that pressure alone is not capable of effecting the liquefaction of gases under certain conditions of temperature," but suggests that better results may possibly be obtained by the aid of powerful refrigeration. Natterer of Vienna has also made valuable experiments in the same line.

Within the last few weeks the problem which for more than half a century has defied all experiments has been solved. Almost simultaneously, yet by different methods, the liquefaction of the supposed permanent gases has been accomplished by Raoul Pictet, of German Switzerland, and M, Cailletet, in Paris. M. Cailletet's apparatus consists of a massive steel cylinder with two openings, through one of which hydraulic pressure is communicated. A very strong small tube passes through the other, and is enclosed in a freezing mixture. It opens within the cylinder into a second smaller cylinder serving as a reservoir for the gas to be compressed. The remaining space in the large cylinder is occupied by mercury. The gas is compressed into the small tube, and then suddenly placed in communication with the atmosphere, when its expansion causes its intense refrigeration.

The original announcement of M. Pictet's discovery is given in another column. The following details are given in *Nature*:—

M. Pictet uses four vacuum and force pumps, similar to those used for making ice in his ice machine, driven by an engine of 15 horse power. Two are employed in procuring a reduction of temperature in a tube about four feet long containing sulphurous acid. With the pumps at full work there is a nearly perfect vacuum over the liquid, and the temperature falls to —85 deg. or —94 deg. F. M. Pictet uses this sulphurous acid to cool the carbonic acid after compression, as water is used to cool the sulphurous acid after compression. This is managed as follows:—In the tube thus filled with liquid sulphurous acid at a temperature of —76 deg. there is another central one of the same length, but naturally of smaller diameter. This central tube M. Pictet fills with liquid carbonic acid at a pressure of four or six atmospheres. This is then let into another tube 12·8 feet long and 1·2 inch in diameter. When thus filled the liquid is next reduced to the solid form and a temperature of —220 deg. F., the extraction of heat being effected as before by the pump.

Now it is the turn of the oxygen. Just as the tube containing carbonic acid was placed in the tube containing sulphurous acid, so is a tube containing oxygen inserted in the long glass tube containing the now solidified carbonic acid. One end of this tube is connected with a strong shell containing chlorate of potash; the other end is furnished with a stop-cock.

When the tube was as cold as its surroundings, heat was applied to the chlorate, and a pressure of 500 atmospheres was registered; this descended to 320. The stopcock was then opened, and a liquid shot out with violence. Pieces of lighted wood held in this stream spontaneously inflamed with tremendous violence.

M. Cailletet first introduced pure nitrogen gas into the apparatus. Under a pressure of 200 atmospheres the tube was opened, and a number of drops of liquid nitrogen were formed. Hydrogen was next experimented with, and this, the lightest and most difficult of all gases, was reduced to the form of a mist at 280 atmospheres. The degree of cold attained by the sudden release of these compressed gases is scarcely conceivable. The physicists present at the experiment estimated it at —508 deg. F.

Although oxygen and nitrogen had both been liquefied, it was deemed of interest to carry out the process with air, and the apparatus was filled with the latter, carefully dried and freed from carbonic acid. The experiment yielded the same result. On opening the tube a stream of *liquid air* issued from it resembling the fine jets forced from our modern perfume bottles.

M. Cailletet reports the liquefaction of nitric oxide at 146 atmospheres, and at +12 deg. F.; the details relative to the other gases are not yet at hand.

The discoveries of MM. Pictet and Cailletet are of the highest importance, both as adding still further confirmation to the dynamic theory of heat, and as opening the way to new studies into the nature of our atmosphere. They will also tend to induce further examination into Professor Graham's inference of the existence of hydrogen in solid form—a substance which he named hydrogenium—believed to exist in an alloy with palladium, and the density of which he calculates to be 0·733. As it appears clearly from the records of the experiments now at hand that refrigeration—as Berthelot predicted—has more to do with liquefaction than compression, it would seem possible to find a limit for our atmosphere, which could not exist in gaseous form if suddenly dispersed in planetary space. The idea is suggested that a boundary may exist at which, through the intense cold, air is always liquefying, falling, re-vapourising, and thus a circulation is constantly taking place.—*Scientific American.*

RELATIVE COST OF WATER AND STEAM POWER.

It having been stated in the *Journal of the Franklin Institute* that the "cost of raising water by water power at the Fairmount Works in Philadelphia was but 2 cents per one million gallons raised 1 foot," Mr. Henry P. M. Birkinbine now says that the 2 cents referred to were expended for simply running the works, that is, attendants, oil, tallow, and ordinary repairs; it did not, however, include the entire cost, but left out of consideration the extraordinary repairs incidental to water power—those of maintaining the dam, head race, gates, &c. Had the calculation been properly made, it would have shown that the cost of raising water at Fairmount by water power was from 10 to 12 cents per million gallons one foot high.

Mr. Birkinbine makes the correction because it was asserted that had steam power been employed instead of water, it would have caused an additional outlay of 13,000 to 19,500 dols. per annum. The conclusion at which Mr. Birkinbine arrives, on a consideration of the whole subject, is that, since the steam engine has been brought to the degree of perfection in simplicity, efficiency, economy, and reliability as we now have it, and as there are few locations in the thickly settled portions of our country where fuel cannot be secured at a moderate price, steam is preferable to water power. This is particularly the case where the water is unfavourably located, and when the trouble incident to drought, floods, &c., is taken into account.

NIGHT DISTRESS SIGNALS.

Under this heading, the last number of that very interesting publication, "The Life-Boat, or Journal of the National Life-Boat Institution, has, in addition to much life-boat information, a very exhaustive article on the above-named subject. And it is therein stated that night distress signals are:—

1. A gun fired at intervals of about a minute.

2. Flames on the ship (as from a burning tar-barrel, oil-barrel, &c.)

3. Rockets or shells of any colour or description fired one at a time at short intervals.

The Act of Parliament decrees that if any master of a vessel should exhibit any of the above signals without being really in distress, he shall be liable to pay compensation for any labour, risk, or loss occasioned by his doing so, which expenses, however, they have persistently resisted.

As far as they go, these signals may be sufficient, but they do not meet the evil to which we have referred, which a distinction of colour would do.

An experienced officer, Captain W. M. Pengelley, of H.M. late Indian Navy, and now dock master at Penarth, a port of Cardiff, has suggested the adoption of the familiar pyrotechnic light, called a "Roman candle," in lieu of the rocket, as being much more easily managed in small vessels and boats, and we think there is much force in his argument.

"Roman candles" throw up a series of fire-balls to a considerable height, at short intervals between each, and, being unlike any other description of firework, would be readily distinguishable, whilst they would undoubtedly be much easier ignited and managed than a rocket, which requires to be adjusted to its staff, and will sometimes separate from it before attaining any height in the air, by which its flight is curtailed. In truth, rockets are practically useless on board small merchant vessels and boats.

The article adds:—Captain Pengelley proposes that the balls thrown up should be detonating, which might be an advantage when the help required was not more than one or two miles distance; but combined with the system suggested, the fire-balls thrown up being red and green, the latter to be used when property only was at stake, and the former when a life-boat's aid was required, we think they would be admirably calculated to effect the desired object. In fact, the definition by colour might be usefully still further extended; thus, green fire-balls might signify that towing help was needed; blue ones, a pilot; plain ones, men and boats; and red ones, a life-boat's help; whilst rockets bursting with single stars of similar colours might have the same signification.

As stated above, the subject is one of vital interest, seeing that lives may at any time be lost through the wrong instead of the right description of help being sent during the night. But it is also a matter of very serious interest to the National Life-boat Institution, seeing that the funds of the Institution are provided by the British public, and that they ought not to be unnecessarily wasted. Yet at any moment of the night, at any time of the year, for want of some such distinctive signals as we have suggested, as many as three, or even four, life-boats, in the locality of outlying banks, such as the Goodwin and those on the Norfolk and Suffolk coasts, may be launched in reply to a signal of distress, at an average total expense of £60.

On both accounts, therefore, we think the time has come for a revision of the night signals established by the Merchant Shipping Act, 1873.

We cannot better define the principles which we think should be kept in view in any such revision than in the following sentences, which were contained in an article on this subject published some four years since in the "Life-boat Journal:"—

"1st. It is indispensable that signals of distress should be few in number and readily distinguishable from all other signals, especially those shown in the night; since persons having to interpret them on the land would in general have no code of signals to refer to, but would have to trust to their memories alone.

"2ndly. They should not be of an expensive or unwieldy character, or of a kind requiring skilfulness in their use, or they would not be available for all classes of vessels.

"3rdly. It would be desirable, as far as possible, to utilise articles already on board rather than to provide new ones unavailable for any other use."

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President, SIR ANTONIO BRADY.

SESSION 1877—1878.

MEMBERS' MEETING.

At a Quarter-past Eight in the Evening,

Thursday, March 14th. "On the 'Trade Marks Act' as Affecting Inventors," by F. W. CAMPIN, Esq., Barrister-at-Law.

Thursday, March 28th. "On Block Telegraph Signals on Railways," by F. H. VARLEY, C.E. The Executive Council meet at 7.30 p.m. on same days.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.
F. W. CAMPIN, Sec.

Proceedings of the Institute.

MEMBERS' MEETING.

On 7th February, the President, Sir ANTONIO BRADY, was present; but no business requiring a report was transacted.

The Conference on Patent Laws, appointed to take place at the Members' Meeting on 7th February, was postponed in consequence of no information having yet been obtained as to the intention of the Government in regard to a New Patent Bill.

NOTE.—Since this Meeting Mr. MUNDELLA, M.P., asked the Attorney-General as to whether he was going to bring in any Bill this session, and the Attorney-General stated it was not at present his intention to do so.

Monthly Notices.

Search for Coal in Kent.—An attempt is, it appears, to be made in search for coal in the vicinity of either Dover or Canterbury. It is proposed to raise £5,000 by subscription, and the work is to be entrusted to the Diamond Rock Boring Company, who hope to reach a depth of 2,000 feet in nine months. A committee has been formed, the Director General of the Geological Survey, Mr. Godwin Austen, and Prof. Prestwich being among its members, with Major Beaumont for Secretary.

M. Cailletet's process for liquefying nitrogen and hydrogen has been described in the *Comptes Rendus*; and M. Berthelot also gives his evidence that he saw the gas in three different states, "de fluide élastique comprimée, de liquide pulverisée, et de fluide en grande partie détendue."

M. Gramme, the inventor of the powerful continuous magneto-electric machine, has been nominated a Chevalier of the Legion of Honour.

Claude Bernard, recently deceased, is worthy of notice as one of the most illustrious of modern physiologists. He was born at St. Julien, near Villefranche, in the department of the Rhône, in July, 1813. He received his medical education at Paris, where he took his degree in 1843. In 1856 he was elected Professor of Experimental Physiology in the Parisian Medical School. Our knowledge of the pathology of diabetes has been much increased by the facts brought forward by Bernard.

Mr. H. N. Moseley's "*Oregon: its Resources, Climate, People, and Productions*" (Stanford) furnishes information which must prove of service to intending colonists. The State, however, in spite of undoubted natural resources, is increasing but slowly in population; but this, no doubt, will change for the better as soon as the Northern Pacific Railway and that to California shall have been completed.

The eminent Swedish botanist, Prof. Elias Fries, died at Upsala on the 8th ultimo, in his eighty-fourth year. The Swedish papers note the singular circumstance that only a few days more than a century should have divided the deaths of Linnæus and the greatest of his Scandinavian successors. Fries was born at Femsjö, on the 15th of August, 1794. Among his many contributions to botanical science may be mentioned his "Systema Mycologicum," (1821-29) and his "Lichenographia Europæa," 1831. He was made a member of the Swedish Academy in 1847, and in 1851 Professor of Botany at the University of Upsala.

M. Eugene Lacroix is to publish a supplement to his works on the Paris Exposition of 1867 and the Exhibitions at Vienna and Philadelphia, in the shape of "Etudes sur l'Exposition de 1878." The first number will appear on the 1st of April.

Dr. Burkhardt, of Weimar, the Chief Keeper of the Archives of the Saxon Duchies, proposes to issue monthly a *Correspondenzblatt der Deutschen Archive*, intended to promote intercourse and interchange of ideas between keepers of Records in Germany.

The Report of Colonel Mason, in the Khedive's service, who was employed last year in making a reconnaissance survey of Albert Nyanza, has now reached this country. According to the very accurate observations of this officer, the south end of this lake reaches no further than 1° 10′ N. lat.; this proves that Beatrice Gulf, visited by Mr. Stanley, and supposed by him to be a part of Lake Albert, must be another and more southerly lake. According to native information supplied to Col. Mason there are several lakes in that direction.

The Chemical Society's Research Fund.—The grants recently made from the Research Fund are:—To Dr. Wright, for the continuation of his researches "On Chemical Dynamics," £50. To Dr. Armstrong £25, for an "Investigation of Camphor and Allied Bodies." To Dr. Carnelly, of Owens College, £20, for a research "On the Hydrocarbons Diphenyl, Ditolyl, Tolylphenyl, &c., and their Derivatives." To Mr. P. Phillips Bedson, of Owens College, £10, for a research on Phenyl-acetic Acid and on the Constitution of Isatin." And to Mr. J. R. Crow, of Owens College, £5, for a research "On the Action of Zinc Ethyl on the Chloride of Vanadium."

THE SCIENTIFIC REVIEW

AND

Scientific and Literary Review.

MARCH, 1878.

THE WORKING OF THE ADULTERATION ACT.

Transcendentalism is not to our taste; for we hold that it comports not with right reason to deal with any subject *in extremis* if this be avoidable.

Nowhere in the wide world is it more requisite to utter and maintain such a doctrine as the above than in this country. John Bull's course of action is either to "let sleeping dogs lie," or else to make a fierce onslaught, with the view of utterly exterminating them. In other words, social evils are left without any attempt at cure being made, or such trenchant measures are adopted that their very severity soon causes reaction and revolt.

Perhaps no better illustration of these ideas could be found than the course which has been adopted in regard to Compulsory Elementary Education and the Adulteration of Food. They have both been acted upon with too much rigour, and in consequence a strong feeling of opposition to them has risen up. At the present moment we shall say nothing about the Elementary Education Act, as to the working of which we have heretofore given some attention, but shall deal with the question of detecting and punishing adulterations of food and drink.

Adulteration of any articles of food or drink with deleterious foreign substances is without doubt morally indefensible, and should be liable to punishment as a criminal offence; but whether simple admixture of foreign substances *not deleterious* should be made a criminal offence is open to dispute. It would seem more properly to constitute a private wrong, to be met by a right to damages. *Caveat emptor*, which left the buyer to defend himself, was formerly a dominant maxim of our law, and freedom of trade would seem to favour the continuance in a reasonable way of this doctrine. For the fact must be steadily kept in view that a very large number of people cannot afford to indulge in *absolutely pure* articles of consumption, as they would be far too high priced for their means; and, moreover, in some cases the question of what is or is not to be considered pure is a debateable matter. Chemicals used in our industries are not expected to be the pure chemicals that should be obtained in the laboratory or the dispensary.

Entertaining as we do the views above enunciated, we have watched with much interest the proceedings from time to time taken under the Adulteration Act, and have specially noted the position taken up by the Public Analysts, for we know full well that scientific witnesses or experts, the position of the analysts, can usually more truly be described as that of advocates than witnesses, and that this will be the case, notwithstanding they may be able and honourable men. Confirmation of this view we find in the annual address of that eminent man of science, Dr. Dupre, F.R.S., F.C.S., the President of the Society of Public Analysts, as reported in that interesting and useful journal, the Analyst. In regard to Public Analysts Dr. Dupre remarks:—

> "Under the Act it is unquestionably the *duty of the Public Analyst* to endeavour to *defend the consumers of food, drink and drugs* from imposture or fraud [the italics are ours], and they being so protected, the Inland Revenue Chemists were not required, as far as the general public was concerned; but the traders complained that in some cases too much heed was given to grievances which were only imaginary and not real on the part of the consumers, and consequently the Inland Revenue Chemists were appointed to protect the vendors. This necessary, although somewhat unfortunate conflict of interests has been perhaps, to a great degree, the cause of the discrepancies which, upon two or three occasions, have been shown by the results obtained by the different chemists."

Dr. Dupre in another part of his address, proves what he here implies, that, although the Inland Revenue Chemists constitute a sort of Court of Appeal, they, too, are in effect advocates, though for the defence:—

> "It is interesting, and I must say sad, to note that the very same officials who some few years ago examined a large number of samples of beer (which it should be noted were not purchased direct from the brewers, but from the retailers throughout the whole kingdom), and who then agreed to a maximum of 50 grains per gallon as being the utmost which it was necessary to allow, have recently signed a certificate and added to it a gratuitous statement that 68 grains of salt is sometimes found in genuine ales. It certainly needs very serious consideration whether these Chemists, acting as they do as a kind of Appeal Court on purely chemical matters, should be allowed to make any addendum of any kind to their certificate. On the first appearance of the thing it certainly seems wiser that they should be compelled to state the facts only, leaving others who are perhaps better qualified than themselves to draw inferences from the facts."

Although we are by no means indifferent to the necessity of taking effective measures for the supression of adulteration, yet we hold that articles or substances that have in the market been considered bona fide, should not be put out of the market by doctrinnaire action; and, further, that the moral of all this seems to be, that the Analysts would be more useful to the public if they could be got to look upon themselves, not as advocates either for prosecution or defence, but simply (as we could wish to be the case with scientific witnesses in Patent law) as testificators to scientific facts; but we suppose it is useless to hope for so much on this side Millennium.

Proceedings of Societies.

ROYAL SOCIETY.

Jan. 17th.—Sir J. Hooker, President, in the chair.—The following papers were read: "On Cobra Poison," by Prof. Pedler; and "On Repulsion resulting from Radiation," Part V., by Mr. W. Crookes.

Jan. 24th.—"New Determination of the Mechanical Equivalent of Heat," by Dr. Joule; "On the Cortical Lamination of the Motor Area of the Brain," by Messrs. Bevan Lewis and H. Clarke; "Remarks connected with the Number of Figures in the Periods of the Reciprocals of Prime Numbers," by Mr. W. Shanks; "Researches in Spectrum Analysis in connection with the Spectrum of the Sun," and "Note on the Bright Lines in the Spectrum of Stars and Nebulæ," by Mr. J. N. Lockyer; and "On the Relative 'Facility of Production' of Chemical Combinations," by Sir B. C. Brodie.

Jan. 31st.—Sir J. Hooker, President, in the chair.—The following papers were read: "Further Researches on the Minute Structure of the Thyroid Gland," by Mr. E. C. Baber; "On Stratified Discharges, V. Discharge from a Condenser of large Capacity," by Mr. W. Spottiswoode; "On the Expression of the Product of any two Legendré's Coefficients by means of a series of Legondré's Coefficients," by Prof. J. C. Adams; and "Experiments on the Colours shown by thin Liquid Films under the action of Sonorous Vibrations," by Mr. S. Taylor.

Feb. 7th.—Sir J. Hooker, President, in the chair.—The following papers were read: "On the Comparison of the Standard Barometers of the Royal Observatory, Greenwich, and the Kew Observatory," by Mr. G. M. Whipple; "On the Diurnal Range of the Magnetic Declination as recorded at the Trevandrum Observatory," by Mr. B. Stewart; and "Note on the Value of Euler's Constant, likewise on the value of the Napierian Logarithms of 2, 3, 5, 7, and 10, and of the Modulus of Common Logarithms, all carried to 260 Places of Decimals," by Mr. J. C. Adams.

Feb. 14th.—Sir J. Hooker, President, in the chair.—The Right Hon. W. H. Smith and the Right Hon. Sir W. H. Gregory were elected Fellows. The following papers were read: "Concerning the Effects on the Heart of Alternate Stimulation of the Vagi," by Dr. Gamgee and Mr. J. Priestley, "On Schulze's Mode of Intercepting the Germinal Matter of the Air," by Dr. Tyndall, "Experimental Contribution to the Etiology of Infectious Diseases, with Special Reference to the Doctrine of Contagium Vivum," by Dr. Klein, and "On the Use of the Reflection Grating in Eclipse Photography," by Mr. Lockyer.

GEOLOGICAL SOCIETY.

Jan. 23rd.—Prof. P. M. Duncan, President, in the chair. Messrs. Eunson, R. C. Forster, W. Mawer, R. H. Solly, and the Rev. A. Watts were elected Fellows. The paper read was "On the Secondary Rocks of Scotland, Part III., the Strata of the Western Coast and Islands," by Mr. J. W. Judd.

Feb. 6th.—Prof. P. M. Duncan, President, in the chair.—Rev. G. E. Comerford-Casey, Lieut.-Col. H. H. Godwin-Austen, Sir W. Jones, Bart., Messrs. J. A. Birds and H. R. Ladell were elected Fellows. The following communications were read: "On some Foraminifera from Pleistocene Beds in Ischia," by M. E. Vanden Broeck, preceded by some geological remarks by Mr. A. W. Waters, "On influence of the Advent of a Higher Form of Life in modifying the Structure of an Older and Lower Form," by Prof. Owen, "Notes on a Crocodilian Jaw from the Coral rag of Weymouth," by Mr. E. T. Newton, and "Note on Two Skull from the Wealden and Purbeck Formations indicating a new Subgroup of Crocodilia," by Mr. J. W. Hulke.

ROYAL SOCIETY OF LITERATURE.

Jan. 23rd.—Sir P. Colquhoun, Q.C., in the chair.—Mr. Carmichael read a paper, in which he dealt with some "Continental Views of the Pompeian Wax Tablets recently discovered in the house of L. Cæcilius Jucundus," and also gave some account of a bronze tablet lately found at Aljustrel, in Portugal. In considering the Pompeian tablets, Mr. Carmichael discussed the various theories of Mommsen, Caillemer, De Petra, and others, concerning the persons who could hold the office of *Auctionator;* and expressed it as his own view that Jucundus was both *Auctionator* and *Argentarius*, a conclusion which he supported by passages from the Roman Law of Sale as bearing on sales by aution. Mr. Carmichael reproduced a portion of the text of the table of Aljustrel, and showed its bearing on philology, and on the legal and social aspect of the provinces of the Roman Empire in the first century after Christ. Dr. Weinemann exhibited some beautiful chromo-lithograph illustrations of the house of Jucundus.

SOCIETY OF ARTS.

Jan. 30th.—Sir R. Alcock in the chair.—Four new members were proposed for election. The paper read was "On the Art Manufactures of Japan," by Dr. Dresser.

Feb. 1st.—Sir G. Campbell, M.P., in the chair.—The paper read was "On the Destruction of Life in India by Wild Animals," by Sir J. Fayrer.

Feb. 6th.—J. M'Clelland, Esq., in the chair.—Six new Members were proposed for election. The paper read was "On Higher Commercial Education." by Dr. J. Yeates.

Feb. 14th.—T. Wills, Esq., in the chair.—The paper read was "On Some Recent Improvements in the Metallurgy of Nickel," by Mr. A. H. Allen.

Feb. 19th.—Admiral Sir E. Ommanney in the chair.—The paper read was "On Egyptian Obelisks and their Relation to Chronology and Art," by Mr. B. H. Cooper.

Feb. 20th.—Lieut.-Col. F. Beaumont in the chair.—Eight candidates were proposed for election. The paper read was "On the Steam Tramways of Paris," by Mr. J. L. Haddan.

QUEKETT MICROSCOPICAL.

Jan. 25th.—H. Lee, Esq., President, in the chair.—Seven new members were elected. Mr. A. D. Michael exhibited and described a specimen of *Glyciphagus Palmifer*, which had been found for the first time in this country. Mr. T. C. White read a paper "On Insect Dissection," in which he explained the best method of procedure, and recommended the various kinds of needles and instruments most suited to the purpose, concluding his remarks by some useful hints as to preservation and mounting. Mr. Ingpen gave some information as to the best form of erecting-glass to be used for the dissecting microscope; and Mr. E. T. Newton pointed out that whilst dissection was of great value in the acquirement of a knowledge of insect structure, it was necessary to supplement it by section cutting. Mr. Newton illustrated his remarks by drawings upon the black-board, showing the valuable results obtained by sections made of the heads of ants.

ARCHÆOLOGICAL INSTITUTE.

Feb. 1st.—G. T. Clark, Esq., in the chair.—Mr. W. M. F. Petrie read a paper "On Ancient Roads," and pointed out how the character of the several occupants, British, Roman, and English, was stamped upon the roads constructed by each. Mr. S. Smith read some "Notes on a Gold Pectoral Cross," which he exhibited. This elaborate work of the sixteenth century was covered with emblems and Latin incriptions grounded in black enamel. Within was an enamelled crucifix upon a translucent ruby enamel ground, the whole being apparently of English workmanship. Several perfect examples of "quarrels," of the latter part of the fourteenth century, were exhibited by Mr. Hartshorne, and a paper read, giving particulars of the construction and method of use of these somewhat rare examples of mediæval weapons. They were obtained from Soest, in Westphalia, and were said to have been made for a certain siege which that place sustained in the fourteenth century. Mr. J. G. Waller exhibited a collection of various bronze implements found near Saltwood, in Kent, and made some observations on the interesting site on which they were exhumed, in the vicinity of two British encampments. The Rev. J. B. Deane exhibited the impression of a silver seal, said to have been found on the field of the battle of Worcester. The arms were those of Deane impaling Chambers. Major-General Sir Henry Lefroy exhibited an impression of a small bronze seal, lately found in Hampshire, containing a rude figure, apparently of the Archangel Michael, and lettering that was doubtfully decipered. Mr. Wilmott sent an ancient iron key of peculiar form, lately dug up near Ramsgate. The Chairman alluded to the great loss the Institute had sustained by the death of Mr. Hewitt, for many years a valued contributor to the pages of the *Journal*, and mentioned the decease of Senhor Soromenho, who was an honorary member of the Institute. The convalescence of Mr. J. H. Parker was a matter for congratulation.

MICROSCOPICAL SOCIETY.

Feb. 6th.—Anniversary Meeting.—H. C. Sorby, Esq., President, in the chair.—Mr. P. B. Mason was elected a Fellow. The Report of the Treasurer was read, and showed a balance in hand of £254 18s. 6d. The Report of the Council stated that the library, cabinet, and instruments were in a satisfactory condition. Obituary notices of deceased Fellows, Dr. Bowerbank and Dr. H. Lawson, were read by the Secretary. Messrs. Glaisher and Curteis having been appointed scrutineers, a ballot for Officers and Council for the ensuing year took place, with the following result: President, H. J. Slack; Vice-Presidents, Dr. L. S. Beale, Dr. C. T. Hudson, Sir J. Lubbock, Bart., and H. C. Sorby. Treasurer, J. W. Stephenson; Secretaries, C. Stewart and F. Crisp; Council, J. Badcock, W. A. Bevington, Dr. Braithwaite, C. Brooke, C. J. Fox, Dr. W. J. Gray, E. W. Jones, Dr. Matthews, S. J. M'Intire, Dr. J. Millar, T. Palmer, and F. H. Ward; Assistant-Secretary, W. W. Reeves. The retiring President then delivered the Annual Address, which chiefly treated of the results of his investigations into a method of obtaining the refractive indices of minerals, and certain curious refractive effects which were observed in the course of his inquiries were described and illustrated.

PHILOLOGICAL SOCIETY.

Feb. 1st.—J. A. H. Murray, V.P., in the chair.—Mr. W. R. Morfill read a paper "On the Bulgarian Language, with Special Reference to the Palæoslavonic." The phonology of the languages was compared, attention being called to the existence of nasals in one of the Bulgarian dialects, a fact unknown till the recent communication of Prof. Drinov in Jagic's "Archiv." The modern Bulgarian was shown to be in a more analytical condition than any other Slavonic language, the inflections of the nouns and adjectives being nearly all gone. In the first position of the article (itself a very un-Slavonic feature) Roumanian and Albanian influences were traced. The views of Schleicher and Miklosich on the relation of Palæoslavonic and Bulgarian and Slovenish were examined. The lecturer concluded with some remarks on Bulgarian literature, which is but meagre, owing to the strenuous resistance of the Turkish Government to all attempts at the education of their rayahs. In conclusion, a few extracts were given from the fine collections of ballads published by the Brothers Miladinov and M. Dozon, and comments were made on the disgraceful forgery of Verkovich, called the Slavonic Veda.

Feb. 15th.—Dr. J. A. H. Murray, V.P., in the chair.—Mr. J. S. Jerram was elected a Member. The paper read was "On Malagasy, the Language of Madagascar," by the Rev. W. E. Cousins, long a missionary in the island. Mr. Cousins gave an account of the various contributions made by Europeans to the study and development of the Malagasy language from the sixteenth century to the present time. The written form of the language now in use was introduced by missionaries of the London Missionary Society about sixty years ago. Substantially one language exists throughout the whole of Madagascar, but there are various dialects. That spoken by the Horas is the principal and most cultivated dialect. The Sakalàva is used on the west coast, and in the northern parts of the island; the Betsimisaraka is spoken on the east coast. and the Betsileo in the interior of the island south of Imerina. The paper contained a description of the principal linguistic features of the Malagasy, and an account of its unwritten literature, which consists chiefly of fragments of history, proverbs, and fables. The relation of the Malagasy to other languages was also discussed, and evidence adduced in favour of regarding it as the most westerly member of the Malayo-Polynesian family. Mr. Cousins showed that, both in its vocabulary and in its grammar, the Malagasy bears the closest analogy to this family. Without denying that an African element may exist in the language, Mr. Cousins maintained that no near relation to any Africian language had yet been proved to exist. At the same time many African words have been introduced as the result of commercial intercourse.

ROYAL INSTITUTION.

Feb. 4th.—Warren De La Rue, Esq., V.P., in the chair.—Lord Claud Hamilton, Col. G. S. A. Anderson, Lieut.-Col. E. B. Frith, Messrs. H. S. Carpenter, R. Burgoyne, E. Haynes, C. Mallett, and J. Pierce were elected Members.

THE INSTITUTION OF CIVIL ENGINEERS.

Feb. 5th.—Mr. Barlow, V.P., in the chair. The monthly ballot resulted in the election of eleven Members, viz., Messrs. W. Anderson, A. Ayres, F. Bell, J. Blackett, A. Brebner, A. Buchanan, W. Errington, C. P. Hogg, E. Newcombe, C. A. W. Pownall, and J. A. Branton Williams, and forty-seven Associates.

Feb. 12th.—Mr. Bateman, President, in the chair.—The paper read was "On the Evaporative Power of Locomotive Boilers," by Mr. J. A. Longridge. The Council, acting under the provisions of the bye-laws, have transferred Messrs. P. Barry, T. Carrington, A. Chapman, J. G. Chapman, R. G. Coke, W. Dean, W. Eliot, G. Fuller, W. S. Howard, J. James, E. J. Lloyd, A. W. Morrant, W. Morris, C. E. W. Ogilvie, G. C. Page, C. Sells, and D. Thomson, from the class of Associates to that of Members.

SOCIETY OF ENGINEERS.

Feb. 4th.—The retiring President, Mr. T. Cargill, presented the premiums of books which had been awarded for papers read during the past year. The President for 1878, Mr. R. P. Spice, then delivered his inaugural address.

ASTRONOMICAL SOCIETY.

Feb. 8th.—Annual General Meeting.—Mr. W. Huggins, President, in the chair.—Parts of the Annual Report were read. Five foreign Associates have died since the last annual meeting, viz., M. Le Verrier, Dr. Bremiker, Dr. Heis, and Prof. Santini. Ten minor planets have been discovered in the course of the past year, and five new comets have been detected, all moving in apparently parabolic orbits. D'Arrest's comet has also been observed on its fifth return to perihelion. An account of the discovery of the satellites of Mars, by Prof. A. Hall, was read, together with a list of the English observers who believe that they have succeeded in observing either both or one of the satellites. Amongst the other matters referred to in the Report were Mr. Hill's paper "On the Motion of the Moon's Perigee; the Astronomer-Royal's Numerical Lunar Theory; Prof. Adams's paper "On the Motion of the Moon's Node;" Dr. Todd's continuation of Damoiseau's Tables of Jupiter's Satellites; Dr. Draper's researches with reference to the existence of oxygen in the Sun; the unsuccessful search for the inter-Mercurial planet Vulcan; Mr. Gill's expedition for observing the opposition of Mars; Mr. Green's drawings of Mars, drawings of the planet Jupiter, the new star in Cygnus; Mr. Birmingham's catalogue of red stars; Mr. Stone's table for star constants; and a Report on the progress of meteoric astronomy. The President delivered the Gold Medal of the Society to Lord Lindsay, to transmit to Baron Dembowski, of Gallarate, near Milan, for his researches in connection with double stars. In delivering his address upon the award of the medal the President remarked upon the quiet and unobtrusive character of the work which had been patiently carried on for twenty-five years by Baron Dembowski. His lists of measure have not been collected into any general catalogue, but are to be found distributed over the pages of the *Astronomische Nachrichten*. The following gentlemen were elected Officers and Council for the coming year: President, Lord Lindsay; Vice-Presidents, A. Cayley, E. Dunkin, W. Huggins, and W. Lassell; Treasurer, F. Barrow; Secretaries, J. W. L. Glaisher and A. C. Ranyard; Foreign Secretary, J. R. Hind; Council, J. C. Adams, Sir G. B. Airy, W. H. M. Christie, D. Gill, E. B. Knobel, G. Nott, E. Neison, Capt. G. L. Tupman, Sir E. Beckett, A. Marth, Capt. W. Noble, and R. A. Proctor.

BRITISH ARCHÆOLOGICAL ASSOCIATION.

Feb. 6th.—H. Syer Cuming, Esq., in the chair.—Mr. J. Reynolds exhibited the four Limoges enamel candlesticks belonging to St. Thomas the Apostle, Bristol, and in describing them noted the evidences in the church documents of the former dedication to St. Thomas a'Beckett, altered *temp.* Henry the Eighth by erasures to that of St. Thomas the Apostle. Mr. R. Smith described a curious twelfth century leaden vessel, recently discovered in the Medway at Rochester; and Mr. L. Brock showed a collection of relics of old London, recently met with in excavations. The Rev. S. M. Mayhew also exhibited many examples, some being of Celtic date, and found at the banks at Walbrook; a coin of Honorius, recently found at Clerkenwell on the site of the Templars' Priory, caused much comment. Mr. Luxmore exhibited a large collection of artistic metal-work recently brought from Spain, with many objects of Moorish style. The first paper was by the Rev. Prebendary Scarth, upon an ancient sculpture fixed in the wall of Bathampton Church, supposed by some to be Roman, but in reality an effigy of an ecclesiastic of eleventh century date. The staff is held in the right hand, as it is also in another example, an ancient figure of St. Swithin, in the neighbouring church of Bathford, of similar date. Mr. Irvine called attention to the existence of a school of sculpture in the locality of these churches, and instanced many examples of very early date, notably the late Saxon angels in the church of Bradford-on-Avon. Two papers followed descriptive of the peculiar interlaced crosses of early date which have recently occupied much of the Association's attention. Mr. Stothard described the cross at Landough, South Wales, and Mr. R. E. Way that at Coplestone, near Crediton. Those both belong to the same class, Saxon in date, and remarkable as further illustration of the extent of the district in which this class of monuments may be found. Mr. Romilly produced and described rubbings from many of similar description in Cumberland and Wales. Among these the cross of Winwick, of enormous size, was specially noted.

SOCIETY OF ANTIQUARIES.

Jan. 24th.—F. Ouvry, Esq., President, in the chair.—Mr. W. K. Foster and the Rev. J. H. Chapman were admitted Fellows. Mr. H. M. Westropp exhibited some fragments of pottery, Roman and pre-historic, found near Ventnor, Isle of Wight. One of the latter class presented a sea-weed pattern, similar to that which was found on an urn exhibited last year by Mr. Westropp. Mr. Westropp also exhibited an armlet of copper, found in Ireland, and a small painted lecythus from Nola. Mr. W. M. Wylie communicated a letter from Dr. Keller on recent Pfahlbau explorations in Switzerland. In connection with this subject Mr. J. E. Lee, who is on the point of bringing out an English version of Dr. Keller's work on lake dwellings (second edition) in two volumes of 700 pages and 200 plates, took occasion to mention, as an instance of Dr. Keller's honourable candour, that whereas he had always been sceptical as to the existence of a *circular* lake dwelling, he had within the last few days written off in haste to inform him that one such had been discovered, in order that his error might be recorded and corrected in the English version of his book. Mr. G. L. Gower made a short communication on a Roman villa at Abinger, Surrey, and promised a fuller account when the excavations were resumed in the spring. Mr. John Evans exhibited a flint instrument of a type not before realized in Britain, and found near Bridlington, Yorkshire. It was semi-lunar in form, and $8\frac{3}{4}$ inches in length, and $2\frac{1}{4}$ in extreme breadth. Mr. Evans believed it to be a kind of sickle or reaping hook, of the class described in his work on stone implements, figs. 268, 269, 270. Prof. M‘K. Hughes exhibited an antique intaglio, in sard, set in a silver ring, and turned out by rabbits in a British camp near Bodfari, on the east of the vale of Clwyd. The gem represented a seated figure holding a palm. Behind was a thurible-shaped object of uncertain use. The work was rude, and was believed by Prof. Hughes to be native imitation of Roman art. Mr. J. D. Leader, Local Secretary for Yorkshire, communicated an account of the excavations which took place last autumn at Templeborough, near Rotherham, at the confluence of the Don and the Rother. This communication was accompanied by small plans of the site. A fuller account will ultimately appear in the *Journal* of the Yorkshire Society. Mr. E. Freshfield called attention to the total and wanton destruction of the brasses which used formerly to adorn the chapel of Winchester College.

Jan. 31st.—The Earl of Carnarvon, V.P., in the chair.—The Very Rev. A. P. Stanley, Dean of Westminster, laid before the society a memoir on the depositions of the remains of Catharine de Valois, Queen of Henry the Fifth. It would appear from this paper that the vicissitudes which this queen underwent after her death were as numerous as any which befell her during her life. Buried originally in the Lady Chapel, she was exhumed when her grandson, Henry the Seventh, built the chapel which bears his name, and the coffin being decayed her body was placed in a wooden chest which stood near her husband's tomb. In this place it was seen in 1631 by Weever, in 1662 by Sandford, and in 1669 by Pepys, who, "by particular favour," was allowed not only to see the body but to kiss the lips of the famous queen. Similar testimony was quoted by the Dean from Fuller (1665), Keepe (1681), Crull (1711), Dart (1723); Gough, at a somewhat later period, speaks of the Westminster scholars getting hold of the bones and throwing them about, and adds that it was there under lock and key, awaiting the opening of a royal vault to which it might be consigned for safety. So it would appear tc have remained till 1776, the year of the death or funeral of the first Duchess of Northumberland, when the Percy vault was made in the chapel of St. Nicholas, and the opportunity was then taken of placing the coffin of Queen Catharine out of sight in the adjacent vault of Sir George Villiers. On the occasion of the death of Lord Henry Percy in December last, an opportunity was afforded of verifying this statement of what had been done nearly a century ago. The wall which separated the vault of the Percys from that of the Villiers was perforated, and through the opening was seen the box containing the bones of Queen Catharine, with a leaden plate recording the fact of their deposition. With the utmost reverence and care the box was removed from a position where it was likely to undergo entire decay from the damp of an adjacent wall, and was carried to the Chantry Chapel of King Henry the Fifth. The Dean then proceeded to give a minute account of the state of the bones after the careful examination to which they were subjected by Mr. Doyne Bell and Mr. George Scharf. On the morning of that very day they had been finally consigned to their fourth and presumably last resting-place, underneath the marble slab of the altar of the Annunciation in the Chantry Chapel, on which had been placed a suitable inscription.

ZOOLOGICAL SOCIETY.

FEB. 5TH.—Prof. Mivart, V.P., in the chair. The Secretary read a Report on the additions to the menagerie during January, and called special attention to a Japanese Wild Dog and a young Penguin (probably *Spheniscus Humboldti*). Papers and letters were read: by Prof. Mivart, "Notes on the Fins of Elasmobranchs, with Considerations on the Nature and Homologies of Vertebrate Limbs;" from Mr. W. A. Forbes, on the birds collected by the Challenger Expedition at Cape York and on the neighbouring islands; from Mr. F. Nicholson, on a collection of birds made in the neighbourhood of Abeokuta, West Africa; by the Rev. S. J. Whitmee, on the mode of the modifications of anger, fear, &c., in fishes, and on the use of their spines, as observed by him during his residence in the Samoan Islands; by Messrs. P. L. Sclater and O. Salvin, on the collection of birds made by Prof. Steere during his recent journey across South America, from Para to Callao; by Prof. Garrod, on the anatomy of the Binturong, *Artictis binturong*, and the fourth portion of his series of notes on the anatomy of Passerine Birds; by Mr. H. Saunders, on the subfamily of the Larinæ, or gulls, being a monographical revision of the group, which he considered to consist of the genera Pagophila, Rissa, Larus, Rhodostethia, and Xema, containing altogether forty-nine species: with regard to Pagophila, he drew attention to a structural peculiarity which appeared to have been previously unnoticed, *i.e.*, the junction of hallux to the inner toe by a serrated membrane; Mr. Saunders also remarked upon the occasional presence of a small but well-developed hind toe and claw in individuals of the Kittiwake (*Rissa tridactyla*) from Alaska; from Mr. M. Jacoby, on some new species of phytophagous Coleoptera; and from Lieut.-Col. R. H. Beddome, on a new family of Tree-Agames from the higher ranges of the Anamallays, and on some new species of Uropeltidæ, from Southern India.

ENTOMOLOGICAL SOCIETY.

FEB. 6TH.—H. W. Bates, Esq., President, in the chair.—Prof. J. O. Westwood, Mr. J. W. Douglas, and Mr. F. Smith were nominated by the President as Vice-Presidents for the ensuing year. Mr. R. S. Standon and Mr. T. W. Wonfor were elected Members. Mr. Meldola read extracts from a letter addressed to Mr. C. Darwin from Dr. F. Müller, containing some valuable information on the discrimination exhibited by a number of butterflies for certain colours in flowers. Mr. Müller also described the odoriferous organ of a male sphinx-moth, which exhaled a strong musk-like odour, and called attention to a secondary sexual character observable in some species of Callidryas and other Pierinæ, in the serration of the costal margin of the anterior wing. This is confined to the males, though sometimes found in the females of the *Callidryas Philea*, but in a far less degree. Reference was made to a sphinx-moth, the proboscis of which, measuring twenty-two centimetres, had been forwarded by Mr. Müller, and was exhibited at the meeting. Sir J. Lubbock read a paper "On the Colours of British Caterpillars," accepting the principle laid down by Mr. Darwin and others, that dull-coloured green and smooth-skinned caterpillars are eaten by birds, &c.; whilst spiny, hairy, and brightly coloured species are rejected. The author stated that by the statistical method it was shown that no hairy caterpillars are green, whilst, on the other hand, a large majority of black and brightly coloured species are hairy, or otherwise protected. Mr. Meldola read extracts from a recent communication by Dr. F. Müller in *Kosmos* on the subject. The following papers were communicated by Mr. C. O. Waterhouse: "Description of a New Dragon-Fly (Gynacantha) from Borneo," "Description of a New Species of Chernetidæ (Pseudoscorpionidæ) from Spain," and "On the Different Forms occurring in the Coleopterous Family Lycidæ, with Descriptions of New Genera and Species.

CHEMICAL SOCIETY.

FEB. 7TH.—Dr. Gladstone, President, in the chair.—The following papers were read: "The Alkaloids of the Aconites, Part II. On the Alkaloids contained in *Aconitum ferox*," by Dr. Wright and Mr. Luff. The alkaloid pseudaconitin from *Aconitum ferox* forms crystallised salts with difficulty. Aconitin from *A. napellus*, on the other hand, crystallises with facility. When acted upon by saponifying agents, pseudaconitin is converted into dimethylprotocatechuic acid and a new base, pseudaconin. Mineral acids saponify pseudaconitin. Tartaric acid forms the anhydro derivative apopseudaconitin. With glacial acetic and benzoic acids an acetyl and a benzoyl derivative are respectively formed. The properties, constitution, &c., of the above substances have been investigated by the authors. The nitrate and the gold salt of pseudaconitin were obtained in the crystalline form. "Notes on the Tannins," by Dr. Paul and Mr. Kingzett. The authors conclude that the supposition that natural tannin from gall-nuts is a glucoside, is doubtful; the astringent principle common to cutch and extract of mimosa bark is shown to be a glucoside, and to yield on decomposition unfermentable sugar, and a peculiar acid distinct from gallic acid. "On the Estimation of Phosphorus in Iron and Steel," by Mr. E. Riley. The author has instituted a series of experiments as to the relative value of the molybdate and magnesia processes for determining phosphorus; as a general result, he concludes that the molybdate process always gives results which are too low, and that the magnesia method is the only one to be trusted. "An Inquiry into the Action of the Copper Zinc Couple on Alkaline Oxy-salts," by Dr. Gladstone and Mr. Tribe. The action of the couple on these oxy-salts is of an electrolytic nature, nitrites and ammonia being at first formed, but ammonia being the final product when nitrates are taken; chlorides are formed when chlorates are decomposed, but no chlorites or hypochlorites could be detected. When ammonium nitrate is acted on at the boiling point, nitric oxide is evolved. "On a New Method for the Determination of Boiling Points," by Mr. H. C. Jones. A glass tube 4 millimetres internal diameter and 200 long is bent into a U, so that one end, which is open, projects 15 millimetres beyond the other, which is closed. The closed leg is filled completely, and the open leg partly, with mercury, and a bubble of liquid manipulated into the closed end of the U. On immersing the U in a paraffin bath, and heating the latter, the liquid boils; the temperature at which the levels of the mercury in the two limbs are equal is the uncorrected boiling point of the liquid.

ANTHROPOLOGICAL INSTITUTE.

JAN. 29TH.—Anniversary Meeting.—Mr. J. Evans, President, in the chair. The President, in the course of his address, alluded to the late conference on the "Antiquity of Man," and expressed his opinion that the question might be discussed with as great advantage from a purely English point of view as from one embracing a larger area, which, to some extent, held good with regard to the question as to whether the palæolithic implements of the river-gravel might not be referred to an interglacial period. As to the relics of human workmanship thought to have been discovered in beds of pliocene and even miocene age in Italy, Switzerland, and France, Mr. Evans again on this occasion repeated the words of caution he had previously expressed, but, nevertheless, believed that eventually traces of man would be found of an earlier date than that which can be assigned either to the cave or river gravels of Western Europe. These traces were to be rather looked for in the east than in the temperate west or colder north. A strong hope was expressed that Indian geologists would before long solve in a satisfactory manner the date and origin of the so-called laterite deposits of Madras, but Mr. Evans was able to announce that in Borneo there appeared a chance of some cave explorations being carried on which will probably throw light on the date of man's appearance in that part of the globe. Mr. Everett, whose experience in cave explorations is well known (*vide Athenæum*, No. 2594), has proposed to devote a year to further researches; and Mr. Evans, having guaranteed the necessary funds, appealed to all those who were interested in the early history of man or in palæontology to assist in raising the amount. The following are the Council elected to serve for the ensuing year:—President, J. Evans; Vice-Presidents, Prof. G. Busk, H. Clarke, Major-General A. Lane Fox, F. Galton, Sir J. Lubbock, Bart., M.P., and Prof. Rolleston; Directors and Hon. Secs., E. W. Brabrook, W. L. Distant, and J. E. Price;. Treasurer, F. G. H. Price; Council, Dr. J. Beddoe, J. Bonwick, C. H. E. Carmichael, Dr. J. B. Davis, W. B. Dawkins, Capt. H. Dillon, Prof. W. H. Flower, A. W. Franks, C. Harrison, J. P. Harrison, Prof. Huxley, A. L. Lewis, R. B. Martin, F. W. Rudler, C. R.

Des Ruffières, Lord A. Russell, Rev. Prof. Sayce, E. B. Tylor, C. Staniland Wake, and M. J. Walhouse.

Feb. 12th.—Mr. J. Evans, President, in the chair.—A paper by Mr. H. C. Sorby, "On the Various Colouring Matters met with in Human Hair," was read. The author described the manner in which the various coloured substances met with in human hair may be separated and distinguished. Four quite different and well-characterized pigments have been obtained, but of these two serve to modify the tints of the hair to only a very limited extent. The general colour is mainly due to a black and a brown-red pigment, both of which can be easily obtained in a separate form, and used like water colours, as shown by the numerous drawings which were exhibited. All the varying tints of black, brown, dark and light red, and most of the pale tints, are easily proved to be due to a variation in the total and relative amount of these two substances, as shown by a series of comparative analyses. The paper concluded with some remarks on the bearing of the facts on ethnology, and with a consideration of the probable explanation of certain changes in the colour of hair occasionally met with, but not yet fully understood. The Director read a paper by the Hon. Mr. Charles C. Jones, "On Bird-shaped Mounds in Putnam County, Georgia."

PHYSICAL SOCIETY.

Feb. 2nd.—Annual General Meeting.—Prof. G. C. Foster, President, in the chair.—The President read the Report of the Council for the past year. After pointing with satisfaction to the present condition of the Society, the Report goes on to show how it is hoped to extend its usefulness in the future. In addition to a second edition of Prof. Everett's work on the C.G.S. system of units, the Council hopes very shortly to publish Sir Charles Wheatstone's papers in a collected form, and it is making arrangements for the publication, at intervals, of translations of foreign scientific papers, especially such as have had a marked effect on the progress of physical science. A portion of the funds of the Society is to be devoted annually to the formation of a library. The following Officers and Council were elected for the ensuing year:—President, Prof. G. W. Adams; Vice-Presidents (who have filled the office of President), Dr. J. H. Gladstone and Prof. G. C. Foster; Vice-Presidents, Prof. R. B. Clifton, W. Spottiswoode, W. H. Stone, and Sir W. Thomson; Secretaries, Prof. A. W. Reinold and W. C. Roberts; Treasurer, Dr. E. Atkinson; Demonstrator, Prof. F. Guthrie; other Members of Council, Capt. W. de W. Abney, Prof. W. F. Barrett, Major E. R. Festing, W. Huggins, Prof. A. B. W. Kennedy, O. J. Lodge, Prof. H. M. M'Leod, the Earl of Rosse, Prof. W. C. Unwin, and R. Wormell. Prof. H. L. F. Helmholtz and Prof. W. E. Weber were elected Honorary Members; and Messrs. M. T. Cormack, C. J. Faulkner, E. M. Jones, C. Leudesdorf, and C. E. Walduck, Members. Prof. S. P. Thompson exhibited an experiment in illustration of Ampère's law of parallel voltaic currents.

Feb. 16th.—Prof. W. G. Adams, President, in the chair.—Mr. G. H. West was elected a Member. Dr. Lodge read for Mr. H. F. Morley, M.A., a paper "On Grove's Gas Battery." Mr. S. C. Tisley described the Harmonograph, specially referring to its use for drawing pairs of curves for the stereoscope. Mr. F. J. M. Page exhibited the action of the telephone on a capilliary electrometer. The construction of Lippman's electrometer as modified by Marey was first explained, and the meniscus of the mercury in the capillary tube was thrown on the screen by the electric light. The delicacy of the instrument was shown by passing a current of 1-1000th of a Danieli, which caused a distinct movement of the mercury. Resistances of 5000 ohms and 1-50 ohm gave approximately the same deflection, so that, in practice, the instrument may be considered to be independent of resistance; in addition to which it possesses the great advantage of portability, and its indications are almost instantaneous. To illustrate the use of the electrometer for physiological investigations, a frog's heart was connected by non-polarizable electrodes with the instrument: each beat of the heart caused a considerable movement of the mercury column. A telephone was now connected; on pressing in the iron plate the mercury moved, and on reversing the wires the movement was seen to be in the opposite direction. On singing to the telephone each note produced a movement, but the fundamental note of the plate as well as its octaves and fifths had the greatest effect. On speaking, the mercury oscilliated continually; some letters of the alphabet had scarcely any effect, and the *w* was especially curious, producing a double movement. Reversing the wires did not alter the character or *direction* of these movements. The same effect was observed when the telephone was in the primary and the electrometer in the secondary coil of a Du Bois Reymond's induction coil. In conclusion, Mr. Page showed the contractions produced in a frog's leg; on inserting under the sciatic nerve two platinum wires coupled with the binding screws of a telephone, and talking to this instrument, violent contractions ensued. In the course of the discussion which followed Prof. G. Bell expressed himself as highly gratified at the results of Mr. Page's experiments. He has made many attempts to ascertain the strength of the current produced by the human voice in vain, but considers the present method will, in all probability, give some most valuable results. He was quite unable to account for the fact that the motion of the mercury took place *from* the opening, but this seems to depend on conditions not yet determined. Mr. Wilson then exhibited, for Prof. S. P. Thompson, a lantern slide galvanometer, for showing the deflections of the needle to an audience.

HISTORICAL SOCIETY.

Feb. 14th.—Dr. B. W. Richardson in the chair.—Seven Members were elected. Dr. Zerffi read a paper "On the Historical Development of Idealism and Realism."

MATHEMATICAL SOCIETY.

Feb. 14th.—Lord Rayleigh, President, and subsequently Mr. C. W. Merrifield in the chair. The following communications were made: "On a general Method of solving Partial Differential Equations," by Prof. L. Tanner, "On the Condition for Steady Motion of a Fluid," by Prof. Lamb, "On a Property of the Fourpiece Linkage, and on a Curious Locus in Linkages," by Mr. A. B. Kempe, "On R. Flower's New Mode (1771) of computing Logarithms," by Mr. S. M. Drach, and "On the Pluckerian Characteristics of the Modular Equations," by Prof. H. J. Smith. Mr. Drach exhibited a large number of drawings of tricircloids made many years ago for Mr. Perigal.

ASIATIC SOCIETY.

Feb. 18th.—Sir E. Colebrooke, Bart., President, in the chair.—Messrs. G. V. S. Fitzgerald, A. R. N. Hawes, and Col. R. Benson were elected Resident Members; and Col. J. T. Norgate, Messrs. D. Barkley, M. E. Naville, H. B. Griggs, and K. Row, Non-Resident Members. Mr. Kingsmill, President of the North China Branch of the Royal Asiatic Society, contributed a paper "On the Migrations and Early History of the White Huns, chiefly from Chinese Sources," in which he traced the wanderings of the *Yueti* (the White Huns or *Ephthalitæ* of the later Greek writers), who, in the latter part of the second century B.C., overran and destroyed the Græco-Bactrian kingdom, after it had subsisted for about a hundred and twenty years. Mr. Kingsmill suggested, on philological grounds, that the word *Vidal* or *Viddhal* was the true rendering of the old Chinese name, and that this might be considered as identical, not only with the *Ephthalitæ* of Procopius, but also with the *Haiathalah* of the Arabs.

STATISTICAL SOCIETY.

Feb. 19th.—Mr. G. J. Shaw-Lefevre, President, in the chair.—Eleven new Fellows were elected. Mr. A. J. Mundella read a paper "On What are the Conditions on which the Commercial and Manufacturing Supremacy of Great Britain depends, and is there any Reason to think they have been or may be Endangered?" Mr. Mundella expressed the belief that this country is in no danger of being surpassed in the field of intelligent and efficient labour, and that the conditions of our commercial and manufacturing supremacy remain unimpaired, notwithstanding the depression of trade. The paper was subsequently discussed by Mr. J. B. Brown, Prof. Leone Levi, Mr. H. J. Crickmay, Mr. Lowthian Bell, Prof. Jevons, and Mr. A. Hamilton, and the further discussion of it was adjourned to the next meeting.

LINNEAN SOCIETY.

Feb. 7th.—Prof. Allman in the chair.—Messrs. A. S. Agar and C. Berjeau were elected Fellows. Sir J. Lubbock, Bart., gave his fifth contribution of "Observations on the Habits of Ants." In continuation of former experiments he finds ants recognize old acquaintances and attack strangers. Their intelligence is questionable in cases where a thin circle of glycerine bars their access to honey which they have already visited by a paper bridge; for when the latter is taken away they do not pile a few grains of earth, and thus cross the barrier. Spite of the many observers and plentifulness of ant's nests, it is still doubtful how their nests commence. Sir John's experiments show that the workers of *Lasius flavus* will not adopt an old queen from another nest. But, on the other hand, the queen of *Myrmica ruginodus* has the instinct of bringing up larvæ and the power of founding communities. As to intimating to each other discovery of food, he considers this does not necessarily imply any power of describing localities, but rather by a simpler sign co-workers accompany each other to the treasure. They do not summon their brotherhood by sounds to a repast found by them. Their affection for friends is outbalanced by hatred of strangers. A few of each kept prisoners in separate bottles, with wide-meshed muslin over the mouths, those free outside again and again excitedly endeavoured to attack the latter, but used no means to free the former, their own companions. Further experiments prove scent, more than sight, guides them in following up food which has been shifted in position after its having been partaken of, and a return to the nest made. Ants avoid light when thrown into their nests, and they then congregate into the darkest corners. Taking advantage of this habit, by a series of ingenious experiments—wherein strips of coloured glass, in other instances shallow cells containing coloured solutions such as fuchsine, bichromate of potash, chloride of copper, &c., were used—Sir John arrives at the conclusion that they are influenced by the sensation of colour, as are bees, though in the case of the ants its effects probably are different from those produced in man. A predominant preference is given by the ants to red, green follows, yellow comes next, while to blue there appears to be a decided aversion. The longevity of ants would seem greater than generally admitted, some specimens of *Formica fusca* being at least five years old. Mr. Thiselton Dyer made a brief communication on the so-called "Rain Tree" of Mogobamba, South America.

From information from Mr. Spruce it seemed probable that the "Rain Tree" was *Pithecolobium Saman*, and the so-called "rain" the fluid excreta of cicidas, which fed on the juices of the foliage. The whole phenomenon was comparable to the production of honey-dew from the lime by the agency of aphides. Then followed a paper "On the Shell of the Bryzoa," by Mr. A. W. Waters. The president having put the motion, it was unanimously resolved to present an address to Prof. C. T. Ernst von Siebold on his approaching jubilee.

A DEAF-MUTE TELEGRAPHER.

Considering the fact that in telegraphy, as now practised, all messages are read from sound, and that on the quickness and good training of the ear depends, to a great extent, an operator's skill, one of the most remarkable cases (in fact, the only one) on record in this or any other country was that of the late Samuel J. Hoffman. Having lost his hearing entirely a short time after learning telegraphy, he nevertheless continued the practice, and successively occupied prominent positions as long as he lived. He made use of a sounder of his own construction, and received by placing his hand over it in such a manner that he could feel distinctly every vibration of the armature. He would thus continue to receive by the hour without "breaking," and experienced no difficulty except when the wire worked hard or the circuit changed frequently; he obviated this by placing his fingers on the binding screws of the relay, distinguishing the characters by the variations of the current. He died in Florida, having gained the reputation of being a most thorough operator and electrician.—*Scientific American.*

COLLEGIATE EDUCATION FOR ALL.

The facilities offered to students, both in the shape of sound and ample instruction and low fees, in some of our colonies may well lead us to think whether nothing more can be done in this country to place collegiate education with the resulting university degrees more easily within the reach of all. In the Maritime Provinces of Canada, this academic liberality is especially apparent. The University of New Brunswick has, during the past few years, been giving increased attention to technical subjects, and the new calendar shows that the authorities at Fredericton have not only made the institution attractive to a large number of students, but that during the past year a large amount of very satisfactory work has been got through. Comparing the number of passes with the number of candidates, it is evident that ample care is taken to maintain the standard to be reached to give a title to the honour of being a graduate of the University; yet the facilities offered for obtaining the necessary instruction are certainly not surpassed by any educational institution in existence. The University being under the direct control of the Government — his honour, the Lieut.-Governor of the Province, the Hon. S. L. Tilley, C.B., filling the office of Visitor on behalf of Her Majesty—every endeavour is made to make it available to all who are worthy of the honours offered; and hence it is that the President—Dr. W. Brydone Jack—has been furnished with an ample staff of professors for the carrying on of the business of the institution.

There is no theological faculty, but every student is required to attend regularly such place of public worship as those having control of him may direct; and with regard to the general curriculum the mention that there are chairs of mathematics, natural philosophy, and astronomy, chemistry and natural science, classical history and history, and French language and literature, will suffice to show that the general education of the student is well cared for; but perhaps the most important features of the establishment, regarding it from a practical point of view, are, first, that a large proportion of the students can get through their undergraduate course (including 40 weeks, board, odging, fuel, light, washing, tuition fees, text-books, library and plate fees, and gymnasium) for £16 10s. sterling per annum, whilst those who are not fortunate or intelligent enough to obtain one of the public scholarships, of which many are open for competition each year, can still pass through for the very insignificant sum of £35 sterling per annum: and, secondly, that so much attention is given to practical engineering, surveying and levelling, navigation and nautical astronomy, and the natural sciences, that whatever place in commerce or industry the graduates may afterwards be called upon to occupy, they will be able to acquit themselves with credit to themselves and to their university, so that it may fairly be hoped that the onward progress of the institution may long continue.

TURNERY WOODS.

In the Eastern Archipelago many woods are found which might probably be utilised if they were better known and introduced into European commerce. A few notes are therefore furnished of some.

Sawoe or sauw (*Mimusops Kauki*, Lam.) is found in Bali and Java. The wood is red and flamed, of hard texture, close grained, and easily worked. It equals box for turnery work and engraving. The hard seeds, called kitjeh, are used for markers in games.

The grey wood of Seroet (*Streblus aspera*, Lour.) of Java, deposited for some time in running water, petrifies, and is used for making bracelets and other ornaments. Under the name of Tjautige or sautige several small trees grow in the central and eastern mountainous regions of Java which are known for their hardness as iron woods. The brown close wood is said to be good for turnery work.

Papila.—This, one of the Rubiaceæ, is a tree of thirty feet high by eight inches in diameter, growing at Gorontalo. The wood is straw coloured, lustrous, and of compact texture, resembling ivory. It is easily worked, is like boxwood, and would be of great value for wood carving or delicate turnery work. Another similar wood is Tolotio, which is either *Kleinhovia hospita*, Lin, or would seem to be allied to the genera *Nauclea* and *Blackwellia*.

Toulimoo, a fruit tree of Gorontalo, has a straw coloured veined wood, with fine undulated fibre. It is knotty, and not easily worked, but seems fit for turnery.

Doenata (*Glochidion molle*, Bl.).—This is another tree of Gorontalo, about eighteen feet high by eight inches diameter, which has a fine, compact, straw coloured wood, well fitted for wood carving and turnery work.

Doedock (*Pemphis acidula*, Forst.) is a small tree growing on the sea coasts, with wood of a fine solid texture, brown colour, and velvety lustre. It is knotty, but fit for turners' work.

Glingsem (*Blackwellia tomentosa*, Vent.) grows in central Java. The inner wood is of a lustrous brown with glossy spots. It is compact and heavy, and much used for turnery work.

Kajoe-fanasa, an undefined tree growing in the Arru Islands, south of New Guinea, has a satiny yellow wood, hard, fine grain, fit for turnery purposes.

Kemoening (*Mrurya paniculata*, Dec.) is much valued by turners.

Lameh (*Alstonia spathulata*, Bl.) grows in the mountain regions of Preangan, Java. The wood is clear, dense, with pure grain, works well, and is used in Europe for carving.

The Letterwood of Amboyna has a close resemblance to that of Guiana, and is probably a variety of *Brosimum Aubletti*.

Deamoedjoe (*Podocarpus cupressina*, R. Br.) is found in the higher regions of Preangan. The wood being light coloured, and of a pure grain, is much valued for technical purposes, especially for wood carving.

Djoengkiel (*Celtis reticulata*, Torr.), found in the west of Java, has a firm and solid wood, which is useful for different technical purposes.

Before concluding these few notes, it may be added that the wood of the Gummarium, genus *Ignotium*, of Brazil, is said to be an excellent substitute for box for wood engraving.—*Journal of Applied Science.*

IMPROVEMENTS IN EXTINGUISHING FIRES ON SHIPBOARD.

The new steamship Sandhurst, 1,600 tons gross register, lately left Glasgow with a full cargo of coals for Bombay. The question of the extinction of fire, which so frequently takes place spontaneously in coal cargoes, has long engaged the attention of shipowners and others, and we are not quite certain whether systematic effectual means have hitherto been adopted to put out fire when once it arises in a coal cargo. The owners of the Sandhurst have long studied this question, and at their request the builders have succeeded in placing on board this vessel a very sensible and powerful machine to enable the crew, in case of fire, to drown it out by large volumes of water. The machine is a large brass pump, worked by an engine attached and fed by a 4 inch copper pipe from the sea. The pump is powerful enough to supply a steady bore of water the full size of the pipes, which are led for delivery for and aft the decks, and can raise and discharge 10,000 gallons an hour. The pump is arranged so that when a quantity of water has been pumped into the hold on a burning cargo, the sea-cock can be closed and the water pumped up, and either discharged overboard or again used to saturate the cargo. In addition to the pump to extinguish fire when it does break out there is an arrangement of pipes throughout the hold through which the thermometers can be passed to test the temperature of any part of the cargo. A number of self-registering thermometers, specially made for this purpose, are on board the ship, and it is intended to test and register the temperature at certain intervals, so that the heating of the cargo in any part may be detected. Where the coals are densely stowed, and through which the thermometer pipes cannot be placed, iron rods are passed through the coals, which can at periods be drawn out to test the temperature in those places. A number of gentlemen connected with influential underwriting firms and the shipping interest in Glasgow visited the ship to inspect the arrangements referred to, and the general opinion is that they are such as to reduce to a minimum the risk of fire ever obtaining a mastery over the ship, or even breaking out. The Sandhurst is the third ship launched during the last twelve months by Messrs. Archibald M'Millan and Son, Dumbarton, for her owners, Messrs. W. R. Price and Co., London.—*Marine Engineering News.*

Chemical Prizes.—Among the prizes offered by the German *Verein zur Befoderung des Gewerbfleisses*, the following may prove of interest to our readers: A silver medal, or its value, and 900 marks (about 200dols.) for an opaque red enamel for gold, silver, copper, and bronze. A gold medal, or its value, 3,000 marks, for a substitute for caoutchouc, the same for a suitable substitute for gutta percha. A prize of 1,000 marks for a concise, critical, and practical treatise on cements; also 1,500 marks for the best investigation of the cause of a change in the zero point of thermometers, with a method of preventing or remedying it. A prize of 2,000 marks for the best series of iron and manganese alloys; at least twenty samples to be prepared, containing from 0·5 to 5 per cent. of manganese.

RECENT AMERICAN AND FOREIGN PATENTS.

An ingenious sounding machine, by which the depth of water is quickly and accurately shown, has been invented by Mr. F. E. Schrom, of Whitewater, Wis. There is an endless graduated indicating belt, combined with the reel that carries the sounding line, to which a relatively low velocity is imparted in such a manner that equal lengths of the line, when winding upon or unwinding from the reel, are represented by much shorter distances moved by any point on the belt. The graduations on the latter are numbered to indicate fathoms and quarter fathoms on the line.

Mr. Daniel H. Merritt, of Marquette, Mich., has patented a new friction gearing, the improvement in which consists in making a triangular or V-shaped groove between the bases of the teeth, at a more acute angle than the latter. The teeth or ribs travel faster at the periphery than at the bases, and are consequently liable to the greatest wear at the outer portion of their surface. By the present arrangement, it is claimed that as the ribs wear away they will maintain their original form.

Mr. Lorenzo Meeker, of Oswego, N.Y., has invented a new lifting jack by which a heavy weight may be lifted either from the ground or from the top of the device. There is a combinatiou of a vertically sliding bar, a peculiarly constructed clutching device, and a lever fulcrumed on the tubular standard, by which the vertically sliding bar is guided.

In a new car wheel, patented by Messrs. H. Scheibel, jun., George M. Seeley, and John Schneider, of Bridgport, Conn., annular elastic packing is interposed between the cylindrical face of the tire and the web, the object being to absorb the jar, deaden the sound, and diminish the force of concussion, thus affording a better riding wheel and reducing the wear on the tire.

Mr. L. Morgenthau, of New York city, has devised a new paper-feeding machine, which consists of a vertically reciprocating and oscillating casing or receptacle, that is arranged with a narrow longitudinal slot at the curved bottom, and filled with some adhesive substance for the purpose of taking up and lifting a sheet of material at the down stroke of the receptacle and carrying it up by the up stroke and by contact with a top stop screw to the feed rolls, so as to be taken up by the same.

Mr. T. A. Blake, of New Haven, Conn., has recently devised a new ore crusher, the object being to secure a regular feed and the avoidance of sudden strains upon the frame or the rods of the machine. The materials to be crushed are broken to uniform size and placed in a hopper. A sliding cover is then adjusted to supply the required material to the rolls. The rotation of a roll beneath the hopper causes an even supply of material to fall from the latter to the crushing rolls, where it is reduced to a uniform powder, either coarse or fine, as may be desired. New devices are provided, so that under sudden strain the rolls are permitted to yield without the necessity of overcoming increased resistance.

Mr. Carl A. Schumacher, of Walla Walla, Washington Territory, has devised a new sewing machine shuttle, one advantage of which is that the tension spring and its fastening are permanently attached to the shuttle case, and consequently none of the parts are likely to become mislaid or lost.

Mr. Clark P. Hayes, of Brooklyn, N.Y., has invented a machine for cutting and grinding logwood, which is intended to take the place of the separate machines now used for that purpose. It works rapidly and separates the fine particles from the coarse chips, which last are conducted away, and re-ground.

Mr. Elson Towns, of Cisne, Ill., has devised a new governor for steam engines, which is so contrived that the relation of the centrifugal force of the rotating balls to the resistance changes as the balls rise or fall; and the relation of the motion of the balls to that of the moving sleeve is also variable, so that the governor is most sensitive when sensitiveness is required.

A new cross tie for railways devised by Mr. David Horrie, of Keokuk, Iowa, consists of a cast or wrought iron tie made of a broad bearing surface, centre bottom rib, and with lateral top flanges, that bind on the base of the rails and firmly secure the same. With this are combined straight screw bolts, having spiked heads that pass in grooves of the tie across the bottom of the rails.

An improved machine for separating fur from pelts or hides has been invented by Mr. Samuel M. Ball, of Fanwood, N.J. In this machine the fur is removed from the skin by a combination of pickers, carrying aprons, and separating screens, arranged in a compact manner. The machine is cheap as well as simple.

Mr. Gideon M'Bride, of Dover Hill, Ind., has invented an improved tellurian for the use of schools, &c., which in a simple manner illustrates the elliptic orbit of the earth aroun the sun and that of the moon around the earth, together with all the phenomena resulting from the relation of these bodies to each other.

Mr. Lorenzo Meeker, of Oswego, N.Y., has invented an improved lifting jack. This has a peculiar construction of a clutch and lever for lifting the load, in combination with a clutch for sustaining it during the alternate movement of the lifting clutch, and differs from other lifting jacks in the construction and arrangement of the sustaining clutch and lever, and in the devices for disengaging the clutch from the bar when it is desired to retract or lower the latter.

In a new millstone gearing devised by Mr. Garrett W. Schreurs, of Muscatine, Iowa, the spindle of the runner stone is so stepped and geared that its motion can be instantly stopped at pleasure or in event of an accident.

THE OROGRAPH.

At a meeting of the French Academy of Sciences, recently held, M. Schrader exhibited his orograph and a geological map of Mont Perdu made with it. The instrument consists of a circular paper-covered plate with central vertical axis carrying a sleeve which can turn round freely. On the top of the sleeve is a telescope, the movements of whose frame in the vertical direction are communicated to a pencil, and transformed by gearing into to and fro movements. If the telescope describes a circle round the horizon, the style describes a corresponding circle on the plate; if the telescope goes up or down, the trace produced is further from or nearer to the central axis. A spirit level being fixed to the telescope, the circle made when it is even gives a means of estimating the height and depressions.

WOODEN SPRINGS FOR VEHICLES.

These springs are adapted to any variety of vehicle, from children's carriages to railway cars. The advantages claimed are lightness, strength, and durability, and that they can be adjusted to carry with safety a greater or less weight; that frost has no effect upon them; and that their cost is about one-fourth that of steel springs.

The ends of wooden spring bars are inserted in cast-iron sockets, where they are separated by small central tongues. A tension rod is provided, the extremities of which pass through the centres of the cast iron sockets, and have nuts screwed on the ends. The outer portion of the nuts are square, so that they may be readily grasped with a wrench, and their inner parts are cylindrical and fit against spiral springs, placed in the castings. Said springs assist the wooden bars to recover their former position when the pressure is removed. By this construction, by simply adjusting the nuts, the strength of the spring may be increased or diminished as desired to suit the weight supported. Clasps protect the bars from wear, and all metal work is handsomely plated or bronzed.

We are informed (says the *Scientific American*, from which we quote this article) that a pair of these springs, weighing 12 lbs., takes the place of a pair of 40-lb. steel springs, and that four such wooden springs, weighing 36 lbs., may be substituted for as many steel springs of 250 lbs. weight. The device can be applied in side bar as well as in elliptic form, and no change of fastening is required to insert it in place of a steel spring in case of the latter being broken or injured.

The invention was patented on December 18, 1877, by George H. Thompson, General Superintendent, Omaha, Neb.

A Novel Life Boat.—Under this title one of our Yankee friends, a Mr. I. Manes, of New Haven, Connecticut, is at the present time soliciting notice by issue of circulars of an Invention which some of our readers may recognise as having been patented by Mr. Tolson, a few years ago. The Invention is certainly worthy of attention, on account of its ingenuity and feasibility, consisting mainly in making the boat as a hollow globe, ballasted in the bottom, and having there stores and water spaces, thus being rendered self righting. This is another instance of so-called American Inventions being simply resuscitated English ones.

Arsenical Antidotes.—From some late experiments Rouyer has found that although the freshly precipitated sesquihydrate of iron is an antidote for arsenious acid, it has no effect in counteracting the action of sodic arseniate or potassic arsenite (Fowler's solution), but that a mixture of a solution of the sesquichloride of iron and the oxide of magnesium will counteract the effect of these salts as well as the arsenious acid itself, and hence this mixture is always preferable to the hydrate in cases of arsenic poisoning. The officinal solution of the sesquichloride of iron should be first administered, and fifteen minutes afterward the magnesia oxide, given in the proportion of four grammes of the latter to one hundred cub. cent. of the former. In one hour after the administration of the antidote a cathartic should be given. The ingestion of acid drinks and lemonade should be avoided during the entire treatment, since the compounds formed by the union are soluble in acids.—*Rep. de Pharm.*

Wonderful Spiders' Web. — Across the "sunny paths" of Ceylon, where the forest meets the open country, and which constitute the bridle-roads of the island, an enormous spider stretches its web at the height of from four to eight feet from the ground. The cordage of these webs is fastened on either side to projecting shoots of trees or shrubs, and is so strong as to hurt the traveller's face, and even lift off his hat, if he is so unlucky as not to see the line. The nest in the centre is sometimes as large as a man's head, and is continually growing larger, as it is formed of successive layers of the old webs rolled over each other, sheet after sheet, into a ball. These successive envelopes contain the limbs and wings of insects of all descriptions, which have been the prey of the spider and his family, who occupy the den formed in their midst. There seems to be no doubt that the spider casts the web loose and rolls it round the nucleus in the centre when it becomes overcharged with carcases, and then proceeds to construct a fresh one, which in its turn is destined to be folded up with the rest.—*From "The World of Wonders"* for February.

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